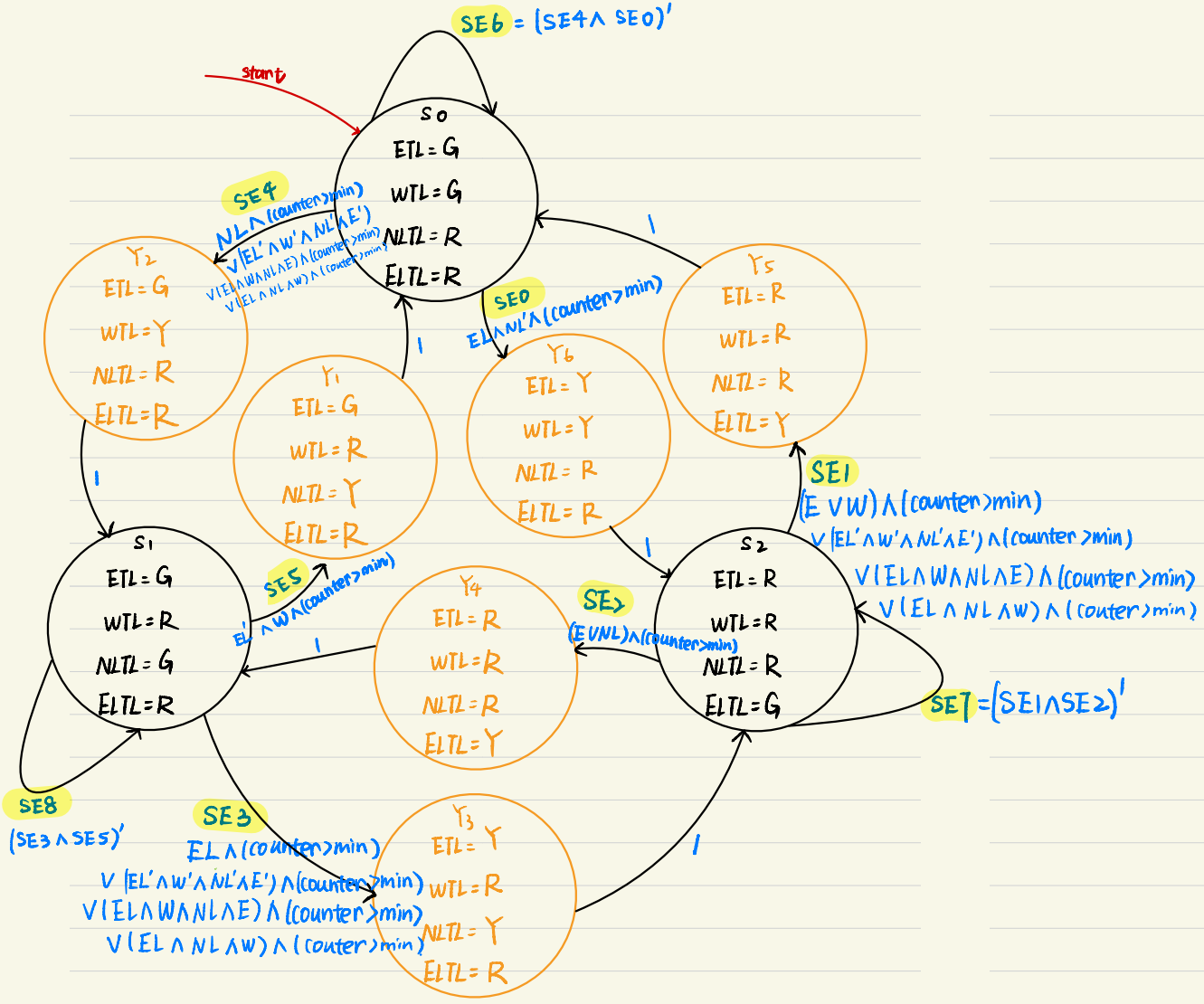


post-lab

1. List the inputs and outputs for the next-state logic (remember that next state is a function of sensor inputs, current state, and count). How many rows and columns would this truth table have? (5 points)

input: sensor input : E . W. NL . EL . CLK, reset each of them are 1 bits — 6 bits
Current state : I have 9 state. Each of them is 4 bits — 4 bits
counter : from 0 to 2. 2 bits — 2 bits
} 12 bits

output: output : ETL WTL NLTL ELTL 4 bits

Columns = #input + #output = 12 bits + 4 bits = 16 bits.
lines = $2^{\#input} = 2^{12}$

2. List the inputs and outputs for the output logic, not including the counter.(Hex outputs are a function of current state.) How many rows and columns would this truth table have? (5 points)

inputs : Current state, We have 9 states, So we need to 4 bits.
outputs : 4 7-bits HEX & Timer / HEX Board 7(bits) : 4x7 = 28 bits.
column = inputs + outputs = 28 + 4 = 32
row = $2^{\#inputs} = 2^4$

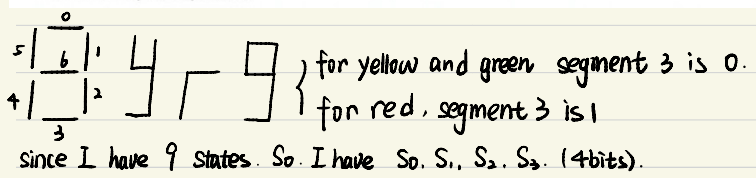
3. How many states are there in your FSM? How many D flip-flops are required to hold all of these states? Do you have unused states? If so, how many? (5 points).

I have 9 states in my FSM
I need 4 D flip-flops.
Yes I have unused states. 16 - 9 = 7 7 state unused.

4. If you had used a one-hot encoding, how many D flip-flops would you need? (5 points).

one-hot means each time only one bit is "1", the rest in "0".
So I have 9 state, means I have 9 bits which means I need 9 D flip-flops.

5. Each segment of the 7 segment displays is the output of a logic function of the current state. Determine the logical function for segment 3 of the W, 7-segment display. Provide the minimal SOP and K-map. (10 points)



for yellow and green segment 3 is 0.
for red, segment 3 is 1
since I have 9 states. So I have S_0, S_1, S_2, S_3. (4bits).
$f(segment\,3) = S_1 + S_2 + Y_1 + Y_3 + Y_4 + Y_5$

S1 : 0001
S2 : 0010
Y1 : 0011
Y3 : 0101
Y4 : 0110
Y5 : 0111

S_2S_3 \ S_0S_1	00	01	11	10
00	0000	0100	1100	1000
01	S1 0001	Y3 0101	1101	1001
11	Y1 0011	Y5 0111	1111	1011
10	S2 0010	Y4 0110	1110	1010

S_3, S_2, S_0, S_1

$f(segment\,3) = S_2 S_0' + S_0' S_3$